News Releases

Surgery at Sea: Studying the Effects of High Deck Accelerations on Surgical Tasks

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(from left to right) aboard the USNS Brunswick (T-EPF-6) observing the surgical mannequin ("Cut Suit") NSWC PCD Personnel – Mr. Eric Pierce Principal Investigator NMRC Personnel – Mr. Thomas Dunn, Deputy Program Manager, Advanced Medical Development, NMRC BUMED Personnel – CAPT Sheri Parker, Director, Systems Capability (M92), Operational Medicine and Capabilities N81 Personnel – LCDR Coleman Chandler, Deputy, Medical Analysis Branch (M813)

SILVER SPRING, Md. – Surgery can be a daunting thought, regardless if you are under the knife or holding it. With many moving parts, surgery can be complicated. Put the operating room on a ship at sea during high sea states, and it gets even more challenging.

Researchers from the Naval Surface Warfare Center Panama City Division and the Naval Postgraduate School spent the voyage conducting experiments to quantify the ability of U.S. Navy medical personnel to perform simulated surgical procedures on life-like mannequins while aboard non-traditional Navy vessels during high sea states. The objectives of the experiments were to investigate the effect of motion induced fatigue, motion induced interruptions, motion sickness incidence, and Sopite syndrome on surgical procedures while in a shipboard environment.

Thomas Dunn, Deputy Program Manager, Advanced Medical Development at the Naval Medical Research Center (NMRC), accompanied by representatives from Naval Operations N81

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Assessments Division and the Medical Analysis Branch (N813); and Operational Medicine and Capabilities Development, Bureau of Medicine and Surgery (BUMED M9) observed the research project "Effect of High Deck Accelerations on Surgical Tasks" aboard the USNS Brunswick (T-EPF-6) during the 15 day maiden voyage and transit from Norfolk, Virginia, through the Panama Canal, and to the final destination , San Diego, California.

"It's crucial we conducted these experiments to test the impact of motion and fatigue on a medical provider's ability to perform surgical procedures during a variety sea states," said Dunn. "We need to be able to translate our results from this research into answers so we can continue to help the Warfighter," he continued.

The experimental surgeries involved active duty Navy medical personnel. The surgical teams were comprised of general surgeons, anesthesiology providers, operating room nurses, surgical technicians, and corpsmen. The surgical teams were responsible for performing resuscitative and surgical procedures on life-like mannequins that have the ability to emulate trauma wounds while providing correct tactile and visual feedback when cut and sewn, as well as breathing, heartbeat, and more, according to Dunn.

"These mannequins aren't ordinary mannequins like those seen in clothing stores; rather they are specifically created to provide realistic training to medical and military personnel. Having a mannequin that is almost life-like really adds to the stress and pressure these individuals are under in an already difficult environment like this," said Dunn.

A total of 112 surgeries were performed at various sea states from sea state 0 to below sea state 5, which is considered by the World Meteorological Organization to be rough water. All procedures were performed under sea state 5 due to safety concerns and the expeditionary fast transport (EPF) shallow draft (under 15 feet) which would require hold of its maneuver position at any sea state higher that sea state 5.

The resuscitative and surgical performance of the teams was evaluated for accuracy, as well as workload analysis. In addition, data was collected and analyzed on areas of dynamic and kinematic motion tracking as well as sleep patterns, daytime sleepiness and psychomotor vigilance performance. This particular data will be used as part of an analysis to provide recommendations on an optimal shipboard emergency room/operating room layout to reduce human vulnerability to craft motion.

Along with the surgical data collected, other data will be used as part of a movement/link analysis to provide recommendations on an optimal shipboard ER/OR layout to reduce human vulnerability to ship motion, added Dunn.

"The experimental research to evaluate surgical procedures while afloat will provide vital data and understanding of the impacts of shipboard environmental conditions on medical personnel's ability to perform potentially lifesaving surgeries," said Cmdr. Michael Cassady, Program Manager, Naval Medical Research Center, Advanced Medical Development.

The Brunswick, an expeditionary fast transport, operated by Military Sealift Command, was selected for this research based on its deck acceleration profile. The Brunswick is a 338-foot vessel capable of transporting 600 short tons of troops 1,200 nautical miles at an average speed

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of 35 knots, or 40 mph.

“It was a challenging experience that will prove to be an important lesson as we continue to explore the challenges and problems associated with surgery at sea on non-traditional vessels,” added Dunn.

The results gathered from this shipboard research will be used to inform Navy Medicine on the effects of ship motion and the shipboard environment with regard to the ability and performance of surgical procedures while afloat